MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2017

July–September 2017—Volume 132, pp. 565–572
https://doi.org/10.5248/132.565

Gonatophragmiopsis verrucosa gen. & sp. nov. and *Pithomyces dimorphosporus* sp. nov. from Brazil

Luís Fernando Pascholati Gusmão[1*], Josiane Santana Monteiro[1]
& Rafael F. Castañeda-Ruiz[2]

[1] *Universidade Estadual de Feira de Santana,*
Avenida Transnordestina, s/n, Novo Horizonte, 44036-900, Feira de Santana, Brazil
[2] *Instituto de Investigaciones Fundamentales en Agricultura (INIFAT) Alejandro de Humboldt,*
Calle 1 Esq. 2, C.P. 17200, Santiago de Las Vegas, C. Habana, Cuba

* Correspondence to: *lgusmao@uefs.br*

Abstract—A new genus and species, *Gonatophragmiopsis verrucosa*, from decaying leaves of an unidentified *Annonaceae*, and a new species, *Pithomyces dimorphosporus*, from decaying leaves of an unidentified dicotyledonous plant, both collected in Brazil, are described and illustrated. *Gonatophragmiopsis verrucosa* is distinguished by distinct, erect, euseptate, unilateral branched, yellowish olivaceous-brown conidiophores; discrete, polyblastic conidiogenous cells; and cylindrical or long oblong, straight or curved, 0–7-septate, verrucose or verruculose, yellowish olivaceous-brown conidia. *Pithomyces dimorphosporus* is characterized by dimorphic conidia: type 1) ellipsoidal, oblong pyriform, obovoid to subglobose, 0–3-septate, echinulate or verrucose, non-rostrate; and type 2) obpyriform, verrucose, 1-septate, with a long rostrate apical cell.

Key words—*Ascomycota*, hyphomycetes, taxonomy, tropics

Introduction

The diversity of conidial fungi in the Brazilian semiarid region has received little attention. During a survey of hyphomycetes associated with decaying plant material from Bahia state, two conspicuous fungi were collected. One showed remarkable differences from all previously described genera (Seifert et al. 2011), and the other was determined as a *Pithomyces* that differed from all previously described *Pithomyces* species. They are both described here as new.

Materials & methods

Samples of litter were placed in paper bags for transport to the laboratory, where they were placed in Petri dish moist chambers and stored at 25°C for 30 days in a 170 L polystyrene box with 200 mL sterile water plus 2 mL glycerol (Castañeda-Ruiz et al 2016). Mounts were prepared in PVL (polyvinyl alcohol and lactic acid) and measurements were made at a ×1000 magnification. Micrographs were obtained with an Olympus BX51 microscope equipped with bright field and Nomarski interference optics. The specimens including holotype are deposited in the Herbarium of Universidade Estadual de Feira de Santana, Bahia, Brazil (HUEFS).

Taxonomy

Gonatophragmiopsis Gusmão, J.S. Monteiro & R.F. Castañeda, **gen. nov.**

MycoBank MB 822036

Differs from *Gonatophragmium* by its broadly flattened or concave, opaque, non-melanized conidiogenous loci and by its strongly verruculose or verrucose conidia, truncate at the base.

Type species: *Gonatophragmiopsis verrucosa* Gusmão et al.

Etymology: Latin, *Gonatophragmi-*, referring to the genus *Gonatophragmium*, + Greek, *-opsis*, meaning "resemblance, similitude".

Colonies on the natural substratum effuse. Mycelium mostly superficial. Conidiophores macronematous, mononematous, branched, septate, brown, yellow-brown, yellowish olivaceous-brown to brown. Conidiogenous cells polyblastic, discrete, sympodial. Conidiogenous loci broadly flatted or slightly concave, not melanized, opaque to obscure. Conidial secession schizolytic. Conidia solitary, unicellular to euseptate, cylindrical to long oblong, truncate at the base, pigmented.

Gonatophragmiopsis verrucosa Gusmão, J.S. Monteiro & R.F. Castañeda, **sp. nov.** Figs 1, 2

MycoBank MB 822037

Differs from all *Gonatophragmium* spp. by its broadly flattened or concave conidiogenous loci and by its strongly verruculose or verrucose basally truncate conidia.

Type: Brazil, Bahia State: Abaíra, 13°11′S 41°41′W, on decaying leaves of an unidentified *Annonaceae*, 16 May 2000, coll. L.F.P. Gusmão (**Holotype**: HUEFS 56638).

Etymology: Latin, *verrucosa*, referring to the small warts on conidial surface.

Colonies on the natural substratum effuse, hairy or somewhat funiculose, yellowish olivaceous brown to greenish yellow-brown. Mycelium mostly superficial, composed of branched, yellowish brown, strongly and tightly verrucose or verruculose but with smooth and basally constricted branches, 2.5–4 µm, with several pigmented granules in somatic cells. Conidiophores

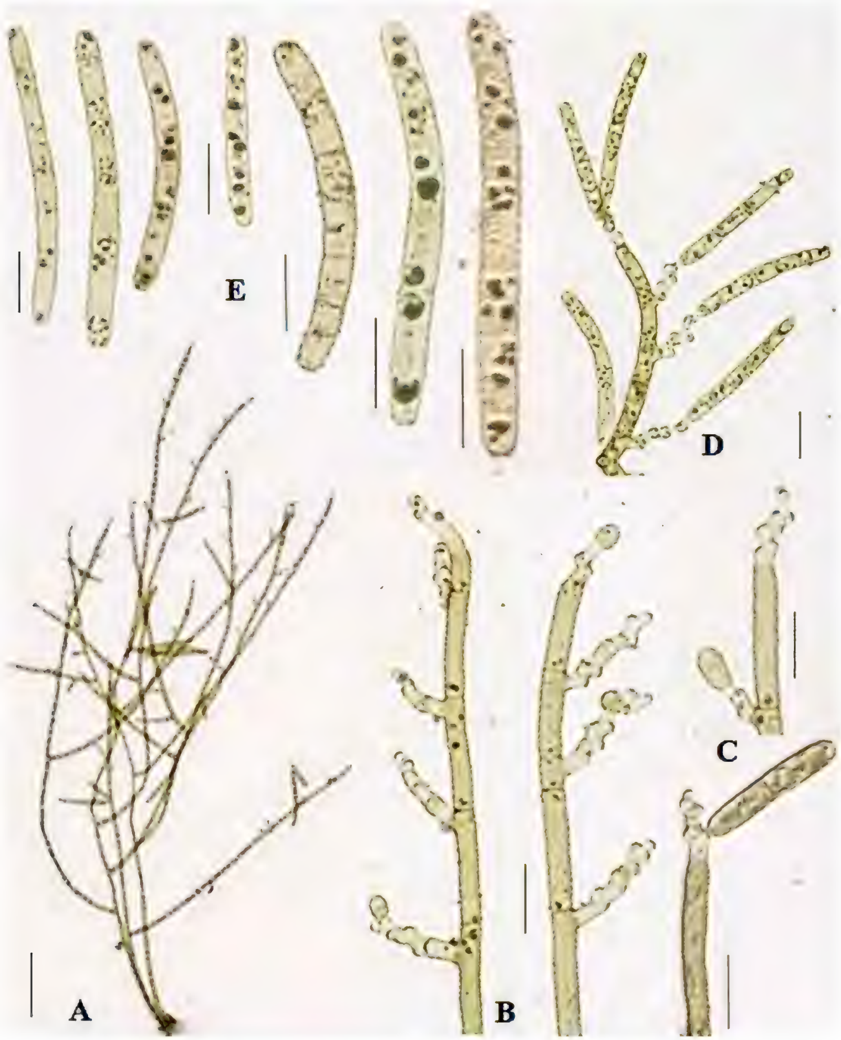

Fig. 1. *Gonatophragmiopsis verrucosa* (holotype, HUEFS56638). A. General aspect. B. Branches with conidiogenous cells. C, D. Conidiogenous cells with conidia. E. Conidia. Scale bars: A = 50 µm; B–E = 10 µm.

macronematous, mononematous or somewhat grouped, branched, mostly unilaterally branched, yellowish brown, strongly and tightly verrucose or verruculose, but with smooth and basally constricted, multiseptate, 350–500 × 4–5 µm. Conidiogenous cells polyblastic, cylindrical, geniculate

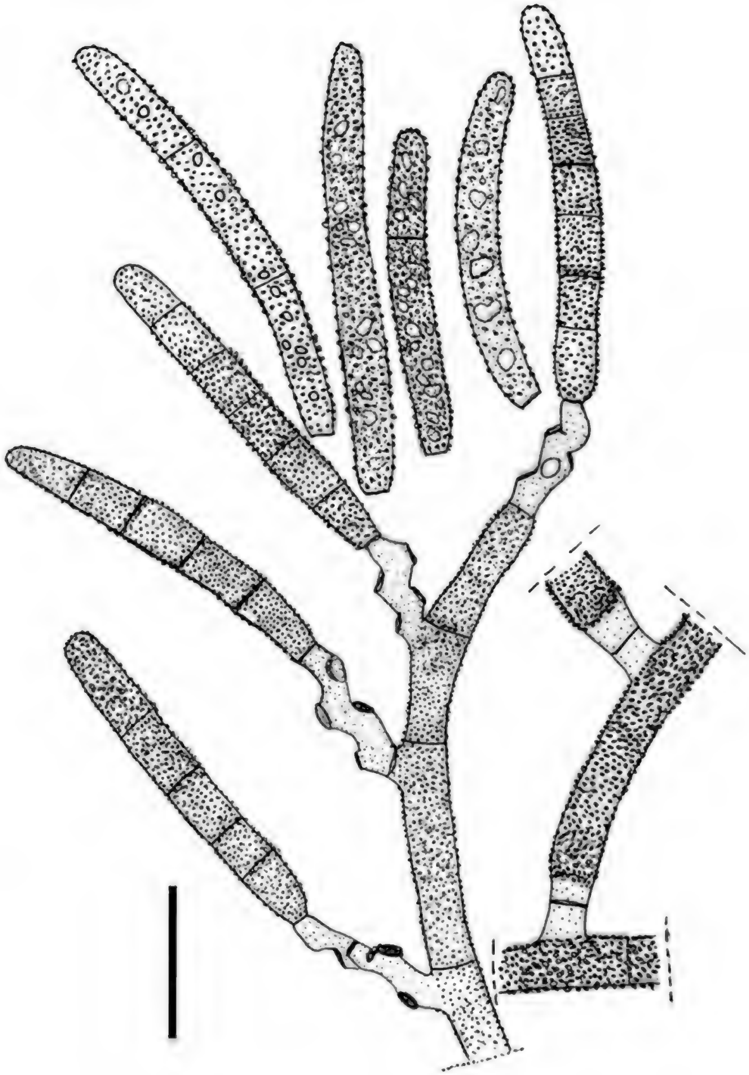

Fig. 2. *Gonatophragmiopsis verrucosa* (holotype, HUEFS56638).
A. Conidia, conidiophores, and conidiogenous cells. B. Detail of bases of branches.
Scale bar = 10 µm.

toward the apex, sometimes terminal, integrated mostly discrete, intercalary, indeterminate with sympodial extensions, 5–20 × 2.5–4 µm. Conidia solitary, acropleurogenous, cylindrical, long oblong, mostly curved, sometimes straight, rounded at the apex, broadly truncated at the base, tightly verrucose or verruculose, 0–7-septate, weakly euseptate, 17–60 × 3.5–4.5 µm, yellowish olivaceous-brown, with several pigmented granules in the lumen.

COMMENTS: *Gonatophragmium* Deighton is superficially similar to *Gonatophragmiopsis* in its unilaterally branched conidiophores and the mostly intercalary, discrete, sympodially extended conidiogenous cells, but *Gonatophragmium* has denticulate conidiogenous loci that are located in typically nodulose swollen areas of the conidiogenous cells, and the conidia are oblong or short cylindrical, mostly curved, attenuate at the base (Deighton 1969). *Stenella* Syd. is somewhat similar to *Gonatophragmiopsis* in its geniculate, sympodially extended conidiogenous cells but is distinguished by conidiophores that are not (or only sparingly) branched, frequently arise from dark pigmented stromata, and with cicatrized conidiogenous loci and by conidia that usually form branched lateral and acropetal chains (Seifert et al. 2011). *Zasmidium* Fr. also resembles *Gonatophragmiopsis* but is distinguished by small conidiogenous loci and conidia with a thickened, basal hilum (Singh et al. 2013). The conidial ontogeny in *Gonatophragmiopsis* is strongly reminiscent of that found in the conidial morph of *Hypoxylon* as illustrated and described by Jong & Rogers (1972).

Pithomyces dimorphosporus Gusmão, J.S. Monteiro & R.F. Castañeda, **sp. nov.** FIGS 3, 4

MYCOBANK MB 822038

Differs from all *Pithomyces* spp. by its dimorphic conidia, produced on the same hyphal conidiomata: either subglobose, oblong, ellipsoidal, pyriform or broadly obovoid, non-rostrate; or obpyriform, with a whip-shaped, long rostrate apical cell.

TYPE: Brazil, Bahia State: Morro do Chapéu, on decaying leaves of an unidentified dicotyledonous plant, 11°35′S 41°12′W, 25 March 2008, coll. L.F.P. Gusmão (**Holotype**: HUEFS 216670).

ETYMOLOGY: Greek, *di-*, meaning "two", + Greek *-morpho-*, meaning "shaped, form", Latin, +*-sporus*, referring to the conidia.

COLONIES on the natural substratum effuse, hairy, pustule-like to punctuate, brown to dark brown. MYCELIUM mostly superficial, composed of branched, pale brown, smooth hyphae, 1.5-2.5 µm diam. CONIDIOPHORES macronematous, mostly reduced to conidiogenous cells. CONIDIOGENOUS CELLS monoblastic, cylindrical, determinate, pale brown, 4–9 × 1.5–2.5 µm. Conidial secession rhexolytic. CONIDIA solitary, acrogenous, dimorphic, verruculose, verrucose, tuberculate or echinulate, dark reddish-brown to dark brown, with a distinct basal frill 1.5–2 µm diam.: type 1) non-rostrate, subglobose, ellipsoidal,

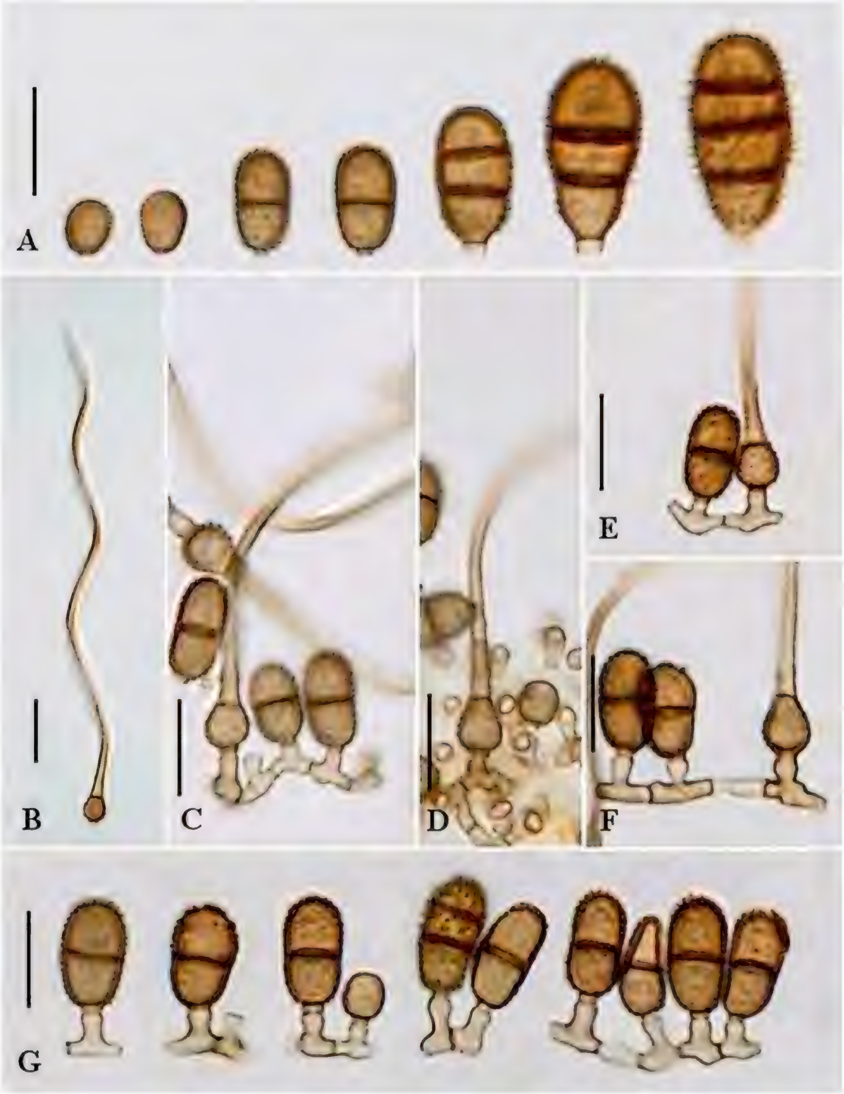

Fig. 3. *Pithomyces dimorphosporus* (holotype, HUEFS216670). A, B. Conidia. C–G. Detail of conidiogenous cells and conidia. Scale bars = 10 µm.

oblong, pyriform, or broadly obovoid, (0–)1(–3)-septate [0-septate 4–6 × 3–4 µm, 1-septate 9–11 × 5–6 µm, 2-septate 10–16 × 5–7 µm, 3-septate 24–27 × 10–12 µm] verrucose or echinulate; type 2) rostrate, brown or reddish brown,

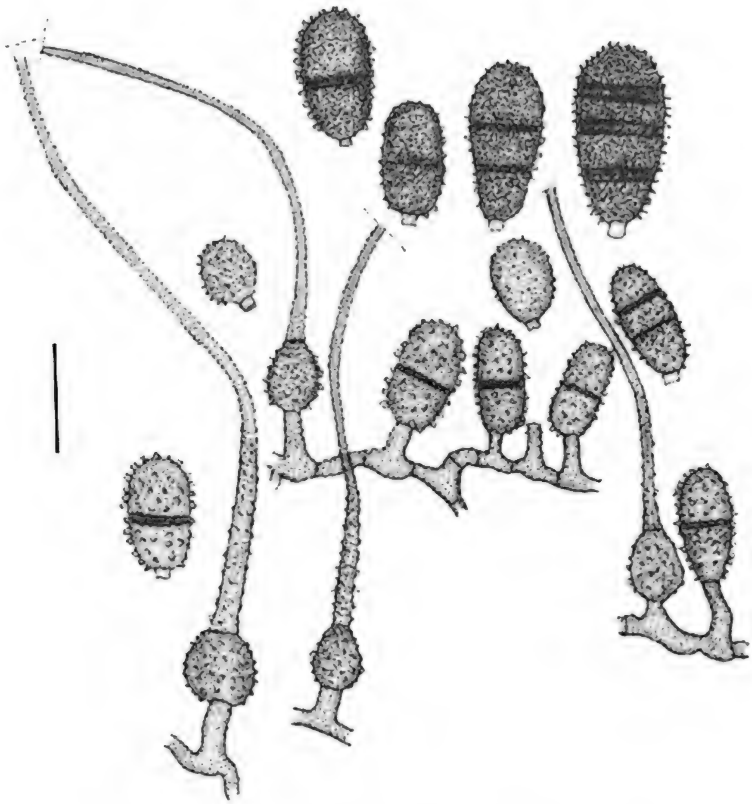

Fig. 4. *Pithomyces dimorphosporus* (holotype, HUEFS 216670).
Conidiogenous cells and conidia. Scale bar = 10 µm.

1-septate, with an obpyriform, verrucose basal cell, 4–7 × 4–5 µm, and a whip-shaped, long rostrate apical cell, 75–110 µm long, verruculose below, smooth above.

Comments: *Pithomyces* Berk. & Broome is distinguished by macronematous or semi-macronematous conidiophores; monoblastic, integrated or discrete conidiogenous cells; and ellipsoidal, oblong, pyriform conidia that secede rhexolytically. Among 46 described *Pithomyces* species, only *P. cupaniae* (Syd.) M.B. Ellis, and *P. graminicola* R.Y. Roy & B. Rai are superficially similar to *P. dimorphosporus* (Ellis 1971, 1976; Zhang & Zhang 2003, 2007): *P. cupaniae* is distinguished by conidia that are oblong-clavate to fusiform, 1-septate, pale to mid olivaceous brown, and 10–20 × 3-5 µm (Ellis 1971) while *P. graminicola* produces conidia that are cylindrical or clavate, 1-2-septate, straw-colored to olivaceous brown, and 12–15 × 6-7 µm (Ellis 1976).

Acknowledgments

We are indebted to Dr. Jian Ma and Dr. De-Wei Li for critical review. We are grateful to Dr. Keith A. Seifert for his opinion and commentaries. The authors thank the National Council for Scientific and Technological Development (CNPq) to Protax (Proc. 150823/2015-0 and 303062/2014-2). The authors are indebted to Drs. U. Braun, R. Singh, D.W. Li, and D. Minter for their generous and valuable assistance with literature RFCR is indebted to Ciência sem Fronteiras (Proc. 45991/2016-8) and OSDE, Grupo Agrícola from Cuban Ministry of Agriculture and Programa de Salud Animal y Vegetal (project P131LH003033). Dr. Lorelei L. Norvell's editorial review and Dr. Shaun Pennycook's nomenclature review are greatly appreciated.

Literature cited

Castañeda-Ruiz RF, Heredia G, Gusmão LFP, Li DW. 2016. Fungal diversity of Central and South America. 197–217, in: DW Li (editor). Biology of Microfungi. Springer International Publishing. https://doi.org/10.1007/978-3-319-29137-6_9

Deighton FC. 1969. New genera and species and redispositions of some hyphomycetes, mainly African. Mycological Papers 117: 8–31.

Ellis MB. 1971. Dematiaceous hyphomycetes. Kew, Commonwealth Mycological Institute.

Ellis MB. 1976. More dematiaceous hyphomycetes. Kew, Commonwealth Mycological Institute.

Jong SC, Rogers JD. 1972. Illustrations and descriptions of conidial states of some *Hypoxylon* species. Technical Bulletin, Washington Agricultural Experiment Station 71. 51 p.

Seifert K, Morgan-Jones G, Gams W, Kendrick B. 2011. The genera of hyphomycetes. CBS Biodiversity Series 9. 997 p.

Singh R, Singh A, Kumar S, Parmatma PU, Castañeda-Ruiz RF. 2013. Two new species of *Zasmidium* from northeastern Uttar Pradesh, India. Nova Hedwigia 98: 257–263. https://doi.org/10.1127/0029-5035/2013/0137

Zhang XG, Zhang TY. 2003. Notes on the genus *Pithomyces* (hyphomycetes) from China. Mycotaxon 85: 241–245.

Zhang XG, Zhang TY. 2007. Taxonomic studies of *Pithomyces* from China. Mycosystema 26: 4–12.